

Pretreatment and during treatment risk factors for dropout among patients with substance use disorders

John McKellar*, John Kelly, Alex Harris, Rudolf Moos

Center for Health Care Evaluation, Veterans Affairs Palo Alto Health Care System and Stanford University School of Medicine, (152), 795 Willow Road, Menlo Park, CA 94025, United States

Abstract

Objective: The aim of this study was to use pretreatment and treatment factors to predict dropout from residential substance use disorder program and to examine how the treatment environment modifies the risk for dropout.

Method: This study assessed 3649 male patients at entry to residential substance use disorder treatment and obtained information about their perceptions of the treatment environment.

Results: Baseline factors that predicted dropout included younger age, greater cognitive dysfunction, more drug use, and lower severity of alcohol dependence. Patients in treatment environments appraised as low in support or high in control also were more likely to drop out. Further, patients at high risk of dropout were especially likely to dropout when treated in a highly controlling treatment environment.

Conclusion: Better screening of risk factors for dropout and efforts to create a less controlling treatment environment may result in increased retention in substance use disorder treatment.

© 2005 Elsevier Ltd. All rights reserved.

Keywords: Dropout; Baseline factors; Treatment environment; Substance use disorders

1. Introduction

Studies of treatment-seeking individuals with substance use disorders (SUD) suggest that, on average, treatment is beneficial (Moyer & Finney, 2002; Weisner, Matzger, & Kaskutas, 2003) and that time spent

* Corresponding author. Tel.: +1 650 493 5000x23366; fax: +1 650 617 2736.

E-mail address: John.McKellar@med.va.gov (J. McKellar).

in treatment is one of the strongest predictors of posttreatment outcomes (McLellan, Luborsky, Woody, O'Brien, & Druley, 1983; Moos & Moos, 2003; Simpson, 1981). Patients who have shorter stays or elect not to complete treatment are at increased risk of readmissions (Moos, Pettit, & Gruber, 1995). Accordingly, it is distressing to note that 10% to 30% of individuals with SUD drop out of treatment (De Leon, 1991; Rabinowitz & Marjefsky, 1998).

1.1. Pretreatment variables predicting dropout from substance use disorder treatment

Although some inconsistency exists across studies, demographic predictors of dropout have included younger age (Joe, Simpson, & Broome, 1999; Leigh, Ogborne, & Cleland, 1984; Mamo & Weinbaum, 1993; Mertens & Weisner, 2000), less education (Mamo & Weinbaum, 1993; Siqueland et al., 1998), being unemployed (Mertens & Weisner, 2000) and being African American (Milligan, Nich, & Carroll, 2004).

Lack of motivation for treatment (Cahill, Adinoff, Hosig, Muller, & Pulliam, 2003; Joe et al., 1999; Ryan, Plant, & O' Malley, 1995; Simpson & Joe, 1993) may be a significant predictor of dropout, however, interpretation of the findings is complicated by the diversity of measures used to assess the construct. Lower severity of substance use problems and fewer dependence symptoms, which may be associated with lower motivation for treatment, are also a predictor of attrition (Joe et al., 1999; Rees, Beech, & Hore, 1984; Ryan, Plant, & O' Malley, 1995). In addition, more drug use (Mertens & Weisner, 2000) and lower cognitive functioning (Erwin & Hunter, 1984) have been associated with drop out.

Studies report that the presence of an additional axis I disorder increases retention (Siqueland et al., 1998), decreases retention (Green, Polen, Dickinson, Lynch, & Bennett, 2002; Kokkevi, Stefanis, Anastasopoulou, & Kostogianni, 1998), or is unrelated to retention (Miller, Ninonuevo, Hoffmann, & Astrachan, 1999). Taken together, these studies suggest that younger patients who are more involved with drugs and have some cognitive impairment and are more likely to drop out of treatment, as are patients who have less severe alcohol problems. However, these person-related variables typically predict only a small proportion of the variance in dropout; thus, it is important to examine treatment-related variables that may predict dropout.

1.2. In-treatment factors related to dropout

One series of studies investigated the relationship between therapeutic alliance, level of treatment engagement, and retention (Broome, Flynn, & Simpson, 1999; Joe et al., 1999; Joe, Simpson, Dansereau, & Rowan-Szal, 2001; Simpson, Joe, & Rowan Szal, 1997). Therapeutic alliance and treatment engagement (e.g., number of sessions during first 3 months of treatment) were positively correlated and, together, these factors predicted long-term retention in treatment (Joe et al., 1999).

Despite these studies' innovative approach to predicting treatment retention, their results are weakened by the lack of data on early dropouts (patients who left treatment in the first 1–3 months), who were excluded. In fact, no studies in our review of the literature obtained follow-up data on patients who dropped out within the first 3 months of treatment.

Nevertheless these more recent treatment retention studies reflect a shift in focus. Implicit in this shift is the understanding that dropping out of treatment is not a static process driven purely by the patient but, instead, is a dynamic process that reflects the interaction between the patient and the treatment

environment. The current study attempts to extend this line of research by measuring the impact of both pretreatment and in-treatment risk factors on dropout from substance use disorder treatment.

2. Methods

2.1. Participants

All male patients at 15 geographically diverse VA SUD residential treatment programs were medically detoxified, and invited to participate in an evaluation of treatment effectiveness. The treatment programs were designed to last 28 days, used individual and group therapy to assist patients in meeting their treatment goals, and were multidisciplinary in nature. A total of 3698 individuals were enrolled at intake. A sub-sample of 49 of these individuals was transferred to a different treatment setting leaving 3649 individuals who provided pretreatment data. A total of 445 individuals (12% of the total sample) dropped out of treatment, that is, left the program prior to completion. Complete intake and discharge data was available for a total of 3289 individuals (90% of the total sample). The average length of stay for patients who dropped out was 13.9 days ($SD=7.2$).

The patients were predominantly African American (47%), or Caucasian (46%) whereas, the remaining 7% were Hispanic, Native American, or Asian individuals. Eighteen percent of the patients were married. The patient's average age was 43 ($SD=9.6$). Most patients (79%) were unemployed, their average income (past 12 months) was \$10,620 ($SD=\9457).

2.2. Procedure

After obtaining informed consent, research staff, independent of the treatment program, asked patients to complete an inventory at baseline and again at discharge. More detailed descriptions of procedures can be found elsewhere (Ouimette, Finney, Gima, & Moos, 1999).

2.3. Measures

2.4. Pretreatment substance-related risk factors

2.4.1. Motivation

Motivation was measured using three scales of the Stages of Change Readiness and Treatment Eagerness Scale, and a composite motivation variable was formed by adding scores from the Taking Steps and Recognition Scales and subtracting the score from the Ambivalence Scale ((Miller & Rollnick, 1991; Miller & Tonigan, 1996)). Higher scores on this measure reflect increased motivation for treatment.

2.4.2. Frequency of drug use

Frequency of (non-prescription) drug use in the past 3 months was reported by patients using 5 response options (0=never, 1=less than once a week, 2=1–3 days a week, 3=4–6 days a week,

4=everyday). Separate scores for each substance (including cocaine, methamphetamines, amphetamine, heroin, other opiates, tranquilizers, hallucinogens, barbiturates, inhalants, and THC) and each method of administration (e.g., smoked, injected, ingested) were summed to derive a composite score.

2.4.3. *Quantity of alcohol use*

Quantity of alcohol use in past 3 months was reported by participants using items adapted from the Health and Daily Living Form (Moos, Cronkite, & Finney, 1990) and reflects the estimated amount of alcohol (beer, wine, or hard alcohol) consumed by the individual on a drinking day.

2.4.4. *Severity of alcohol dependence*

Patient's level of alcohol dependence was measured by their responses to nine questions derived from the nine criteria for alcohol dependence (each scaled from 0=never to 4=almost everyday) in DSM-III-R (APA, 1987). Scores on this scale range from 0–36 ($\alpha=.94$).

2.4.5. *Substance use-related problems*

Patients also completed the Problems From Substance Use Scale, that taps problems in health, legal, monetary, occupational, and intra- and interpersonal, and residential domains Ouimette, Finney, & Moos, 1997). The 18 items are scored on a 5-point scale ranging from 0 (never) to 4 (often) ($\alpha=.88$).

2.5. *Pretreatment psychiatric risk factors*

2.5.1. *Psychiatric Symptoms*

Twenty-two items from the Brief Symptom Inventory (Derogatis & Melisaratos, 1983), measuring depression, anxiety, paranoia, and psychotic symptoms, were summed as a measure of psychiatric symptoms; each item was rated on a five-point scale (0=not at all to 4=extremely) ($\alpha=.94$).

2.5.2. *Cognitive functioning*

This construct was measured by 20 items from the Abstraction subscale of the Shipley Institute of Living Scale (Shipley, 1940). For each item, participants were presented with a logical sequence and asked to fill in the numbers or letters that best complete the sequence. Higher scores indicate better cognitive functioning.

2.5.3. *Axis I diagnosis*

Psychopathology and substance dependence diagnoses were assessed using the International Classification of Diseases-9th Revision (ICD-9-CM) (HCFA, 1991). Presence or absence of an Axis I mental health diagnosis was judged by trained clinical staff at intake into the program and recorded in the nationwide VA Patient Treatment File.

2.6. *In-treatment environmental risk factors*

2.6.1. *Support*

Patients' perceptions of the supportiveness of the treatment environment were measured using the 10-item Support subscale of the Community Oriented Programs Environment Scale (COPEs; Moos, 1996,

1997). This subscale measures the extent to which program staff members are perceived as encouraging, caring, helpful, and empathic to patients (average Cronbach's $\alpha = .78$). A sample item indicative of support is, "The staff go out of their way to help new patients get acquainted here." Higher levels of support in a treatment environment is predictive of better SUD outcomes at discharge (e.g., Lemke & Moos, 2001; Kaspro, Frisman, & Rosenheck, 1999) and at 1-year follow-up (e.g., Moggi, Ouimette, Moos, & Finney, 1999; Long, Williams, Midgely, & Hollin, 2001). Similarly, in psychiatric patients, higher levels of support predict higher satisfaction with treatment and greater likelihood of setting personal goals in treatment (Berghofer et al., 2001; Eklund & Hansson, 2001), as well as decreased need for psychiatric medications (Mosher, Ballone, & Menn, 1995).

2.6.2. *Staff control*

Patients' perceptions of the level of control exerted by program staff were measured using the 10-item Staff Control subscale of the COPEs (Moos, 1996, 1997). This subscale measures the extent to which program staff strictly enforce rules and penalize patients for not following rules (average $\alpha = .64$). A sample item indicative of higher levels of staff control is: "Patients who break the rules are punished for it." Lower levels of staff control predict better short term (Kaspro et al., 1999) and longer term SUD outcomes (Long et al., 2001) and lower levels of psychiatric symptoms such as anger and distress (Eklund & Hansson, 1997).

2.7. *Analytic plan*

The initial data analytic step involved logistic regression analyses to identify baseline predictors of dropout (yes or no). Next, we employed logistic regression analyses to identify treatment environment factors that independently predicted dropout over and above the baseline patient factors. The final step of the data analysis involved summing significant pretreatment predictors of treatment dropout into a risk index to test, using logistic regression, whether risk factors interacted with aspects of the treatment environment in the prediction of dropout.

Usual methods of handling missing data (e.g. case-wise deletion, mean imputation, etc.) have been shown to introduce serious bias to analyses (Schafer, 1997; Schafer & Graham, 2002). To minimize bias due to missing data (10% in the current sample) and to maximize the number of cases used in the analyses, we used the model-based multiple imputation procedure described by Schafer (Schafer & Graham, 2002) that has been shown to provide efficient, accurate, and reliable inferences. The results reported here were obtained by conducting analyses on the imputed data sets.

3. Results

3.1. *Pretreatment risk factors*

The first set of analyses focused on identifying pretreatment variables predictive of dropout from treatment (yes/no). Potential pretreatment risk factors included the demographic, substance-related, and psychiatric variables described earlier. Each of the three sets of variables (e.g., demographic variables) was entered in a separate logistic regression analysis. A familywise type I error rate was set at .01, to adjust for multiple significance tests.

Table 1
Logistic regression analyses of pretreatment risk factors for dropout

Pretreatment Risk factors		<i>B</i>	S.E.	OR	95% confidence interval		Sig.
Demographic	Age	−.016	.006	.98	.97	.99	.004*
	Education	.007	.029	1.01	.90	1.13	.820
	Ethnicity (White vs. African American/other)	−.055	.052	.95	.73	1.10	.290
	Employment (part or full vs. unemployed)	−.102	.069	.90	.79	1.03	.139
Substance-related	Motivation	−.009	.007	.99	.98	1.01	.200
	Frequency of drug use	.052	.012	1.05	1.03	1.08	.001*
	Quantity of alcohol use	.011	.005	1.01	1.00	1.02	.029
	Severity of alcohol dependence	−.019	.006	.98	.97	.99	.001*
	Substance use-related problems	.006	.004	1.01	.99	1.01	.16
Psychiatric	Psychiatric symptoms	.000	.003	1.00	.98	1.03	.970
	Cognitive functioning	−.013	.005	.99	.97	.99	.011*
	Axis I diagnosis (yes/no)	.006	.068	1.01	.88	1.15	.92

Note: Each class of variables represents a separate regression model. Type I error rate is set at .013 to adjust for number of analyses (.05/4).

Results from pretreatment variables revealed that individuals who were younger ($OR=.98$, $p<.004$), reported more frequent drug use ($OR=1.05$, $p<.001$) had poorer cognitive functioning ($OR=.99$, $p<.011$) and reported fewer symptoms of alcohol dependence ($OR=.98$, $p<.001$) were at significantly greater risk of dropping out of treatment (Table 1). Next, we constructed a risk index based upon the four significant pretreatment indicators (younger age, low cognitive functioning, more frequent of drug use, and less alcohol dependence). Patients were coded with a “1” for each risk factor; that is, if their age was under 40, cognitive functioning was in the lowest third of the distribution, frequency of drug use was in the highest third, and level of alcohol dependence was in the lowest third of the distribution. These scores were summed to produce a 4-point risk index ranging from 0 (low risk of drop out) to 4 (high risk of dropout). As shown in the first column of Table 2, the proportion of patients dropping out increased in an approximately linear fashion as the number of risk factors increased (Biserial $rb=.11$, $p<.0001$). Among patients with none of the four risk factors, only 7.8% dropped out of treatment, whereas, among patients with all four risk factors, 31% dropped out of treatment.

Table 2
Relationship between risk for dropout, overall dropout rates, and dropout rates by degree to which treatment is perceived as high or low in Staff Control

Risk factors	Treat settings combined		Low staff control milieu		High staff control milieu	
	<i>n</i>	Dropout rate	<i>n</i>	Dropout rate	<i>n</i>	Dropout rate
0	893	7.8% (70)	645	7.3% (47)	248	9.3% (23)
1	1321	11.9% (157)	854	10.1% (86)	467	15.2% (71)
2	998	13.7% (137)	590	10.0% (59)	408	19.1 (78)
3	402	17.4% (70)	219	12.3% (27)	183	23.5 (43)
4	35	31.4% (11)	16	6.3 (1)	19	52.6 (10)

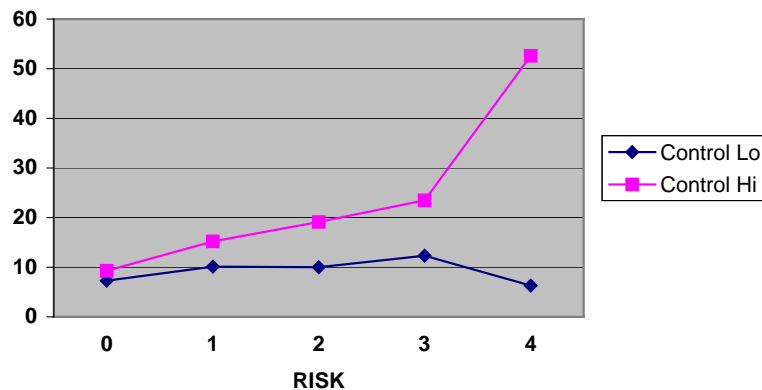


Fig. 1. Interaction effects of level of Staff Control and Risk Level on Percent Dropped Out.

3.2. In-treatment environmental risk factors

We next examined whether patients' perception of the treatment environment was predictive of dropout. We found that perceiving less support ($OR=.86$, $p<.0001$) and more staff control ($OR=1.26$, $p<.0001$) significantly increased the odds of dropping out of treatment. Among patients perceiving high support and low staff control, the drop out rate was 5%, whereas among patients who perceived low support and high control the drop out rate was 16%.

3.3. Can treatment environment modify risk for dropout among high risk individuals?

Given that pretreatment risk factors and patients' perception of the treatment environment both predicted dropout, we next investigated whether pretreatment risk for dropout was modified by the treatment environment. We predicted that high-risk patients in treatment environments high in support and low in staff control would be less likely to drop out. Logistic regression analyses indicated no interaction for the number of risk factors by level of support ($OR=.97$, $p=.65$). However, a significant interaction for number of risk factors by level of staff control was detected ($OR=1.55$, $p<.001$). Dropout rates in programs that were high (top half) and low (bottom half) in staff control are shown in Table 2.

As shown in Fig. 1, for patients in an environment characterized by low staff control, the risk factors made little difference for dropout. However, in a high staff control environment, patients at higher levels of risk were significantly more likely to drop out.

4. Discussion

We examined the influence of pre- and during-treatment variables on risk for drop out among individuals undergoing intensive SUD treatment. Younger patients, patients with more frequent drug involvement and more severe cognitive dysfunction, and patients with less severe alcohol dependence were at higher risk for drop out. Treatment environments that were perceived as more supportive and less controlling were independently associated with a lower likelihood of dropout; moreover, individuals

at higher risk were less likely to drop out if treated in programs that were moderate to low in staff control.

4.1. Patient factors predictive of dropout

Consistent with prior studies, younger patients (Joe et al., 1999; Leigh, Ogborne, & Cleland, 1984; Mammo & Weinbaum, 1993; Mertens & Weisner, 2000; Rabinowitz & Marjefsky, 1998; Siqueland et al., 1998), and patients with less severe alcohol dependence (Joe et al., 1999; Rees et al., 1984; Ryan et al., 1995), were more likely to drop out. These findings may be due to factors such as a shorter substance use history, less chronicity, and fewer adverse consequences, which, in turn, may be associated with less perceived need for treatment.

Consistent with Mertens and Weisner (2000), more frequent use of drugs other than alcohol was associated with a higher likelihood of treatment dropout. Individuals who use drugs more frequently may be more impulsive, be more heavily involved in illegal activities and the counterculture, and have a social network that counteracts the influence of treatment.

Patients lower in cognitive functioning also had higher odds of dropout, independent of their psychiatric symptoms and the presence of axis I psychiatric comorbidity. Cognitive deficits, which are common among patients with substance use disorders, are associated with decreased attention and lower information processing and abstract reasoning (Godding, Figgerling, Schmitz, Seville, & Parisi, 1992). Clinicians judge patients with more cognitive impairment to have a poorer prognosis (Leber, Parsons, & Nichols, 1985) and, in fact, these patients are less likely to retain important treatment content (Godding et al., 1992). Taken together, these four variables were relatively robust predictors of drop out; thus, they provide a preliminary empirical basis to guide clinical screening of SUD patients at the onset of treatment.

4.2. Treatment factors predictive of dropout

Aspects of the treatment environment were related to dropout and accounted for additional unique variance in dropout over and above patients' characteristics at intake. Specifically, treatment environments that patients perceived as more supportive and less rigid and controlling were associated with lower odds of dropout. A high level of program support has been associated with a lower likelihood of dropout in several prior studies (Moos, 1997). Furthermore, high-risk patients were less likely to drop out when they were treated in less controlling treatment environments, suggesting that moderate structure that is not perceived as restrictive can strengthen motivation for continuing treatment among individuals who may be less attracted to treatment initially. Although many patients with substance use disorders need a clear and well-ordered environment, staff members' attempts to help them control their impulsivity may be perceived as intrusive. Accordingly, clinicians need to find ways to implement supportive programs that involve patients in decisions about their own treatment and that are relatively structured but do not create a rigid or punitive setting that impels patients to leave treatment.

Most important, our findings show that patients' experiences in the early stages of treatment can counteract or modify their initial propensities to remain in, or leave, professional treatment prematurely. In this vein, a more supportive treatment environment was related to a lower likelihood of dropout from 12-step self-help groups, primarily because of its positive influence on high-risk patients (Kelly & Moos, 2003). These findings highlight the value of examining the contextual effects of treatment programs for substance use disorders and are encouraging clinically, because treatment environments can be modified

by program change efforts (Aubry, Bradley, Siddique, & Leblanc, 1996; Hansen & Slevin, 1996; Moos, 1997).

4.3. Limitations and future directions

Some factors should be considered before generalizing from our findings. Specifically, our results are based on male VA patients treated in residential settings, the majority of whom were economically disadvantaged individuals. Thus, the findings may not extrapolate to women and individuals treated in other public and private settings. Another caveat is that we did not obtain information about patients' specific reasons for premature termination. Such information should help to understand patients' rationale for leaving the program, and might lead to the formulation of effective interventions to motivate continuation in treatment.

Engaging and retaining individuals with substance use disorders in treatment is a perennial challenge for treatment programs and providers, especially because a substantial proportion of patients end treatment prematurely. We have identified demographic, substance-related, and cognitive variables measured at treatment entry associated with an increased risk for dropout, and have shown that specific aspects of the treatment environment may counteract these risks. Clinicians may be able to reduce dropout rates by screening for risk factors and targeting high-risk patients for motivational enhancement efforts, as well as by balancing the need for program structure with a supportive treatment milieu that engages and motivates patients to remain in treatment.

Acknowledgements

This work was supported by the Department of Veterans Affairs Quality Enhancement Research Initiative, Mental Health Strategic Health Care Group, and Health Services Research and Development Services. The views expressed are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs.

References

- APA, C. (1987). *The diagnostic and statistical manual of mental disorders* (Third-Revised ed.). Washington, D.C: American Psychiatric Association.
- Aubry, T., Bradley, L., Siddique, C. M., & Leblanc, A. (1996). Program development on an acute inpatient psychiatric unit. *Journal of Mental Health, 5*, 507–514.
- Berghofer, G., Lang, A., Henkel, H., Schmidl, F., Rudas, S., & Schmitz, M. (2001). Satisfaction of inpatients and outpatients with staff, environment, and other patients. *Psychiatric Services, 52*(1), 104–106.
- Broome, K. M., Flynn, P. M., & Simpson, D. D. (1999). Psychiatric comorbidity measures as predictors of retention in drug abuse treatment programs. *Health Services Research, 34*(3), 791–806.
- Cahill, M. A., Adinoff, B., Hosig, H., Muller, K., & Pulliam, C. (2003). Motivation for treatment preceding and following a substance abuse program. *Addictive Behaviors, 28*(1), 67–79.
- De Leon, G. (1991). Retention in drug-free therapeutic communities. *NIDA Research Monograph, 106*, 218–244.
- Derogatis, L. R., & Melisaratos, N. (1983). The brief symptom inventory: An introductory report. *Psychological Medicine, 13*(3), 595–605.
- Eklund, M., & Hansson, L. (1997). Relationships between characteristics of the ward atmosphere and treatment outcome in a psychiatric day-care unit based on occupational therapy. *Acta Psychiatrica Scandinavica, 95*, 329–335.

- Eklund, M., & Hansson, L. (2001). Ward atmosphere, client satisfaction, and client motivation in a psychiatric work rehabilitation unit. *Community Mental Health Journal*, 37, 169–177.
- Erwin, J. E., & Hunter, J. J. (1984). Prediction of attrition in alcoholic aftercare by scores on the Embedded Figures Test and two Piagetian tasks. *Journal of Consulting Clinical Psychology*, 52(3), 354–358.
- Godding, P. R., Figgerling, J. M., Schmitz, J. M., Seville, J. L., & Parisi, S. A. (1992). Discriminative utility of a brief cognitive status assessment with alcoholics and the impact of cognitive status on acquisition of treatment relevant information. *Psychology of Addictive Behaviors*, 6, 34–40.
- Green, C. A., Polen, M. R., Dickinson, D. M., Lynch, F. L., & Bennett, M. D. (2002). Gender differences in predictors of initiation, retention, and completion in an HMO-based substance abuse treatment program. *Journal of Substance Abuse Treatment*, 23(4), 285–295.
- Hansen, J. T., & Slevin, C. (1996). The implementation of therapeutic community principles in acute care psychiatric hospital settings: An empirical analysis and recommendations to clinicians. *Journal of Clinical Psychology*, 52(6), 673–678.
- Health Care Finance Administration (1991). *The international classification of diseases, 9th revision, clinical modification (ICD-9-CM)* (4th Edition). Washington: Health Care and Finance Administration, Government Printing Office No. DHHS Publication No. (PHS) 91-1260.
- Joe, G. W., Simpson, D. D., & Broome, K. M. (1999). Retention and patient engagement models for different treatment modalities in DATOS. *Drug and Alcohol Dependence*, 57(2), 113–125.
- Joe, G. W., Simpson, D. D., Dansereau, D. F., & Rowan-Szal, G. A. (2001). Relationships between counseling rapport and drug abuse treatment outcomes. *Psychiatric Services*, 52(9), 1223–1229.
- Kaspro, W., Frisman, L., & Rosenheck, R. (1999). Homeless veterans; satisfaction with residential treatment. *Psychiatric Services*, 50, 540–545.
- Kelly, J.F., & Moos, R. (2003). Dropout from 21-step self-help groups: prevalence, predictors, and counteracting treatment influences. *Journal of Substance Abuse Treatment*, 24(3), 241–250.
- Kokkevi, A., Stefanis, N., Anastasopoulou, E., & Kostogianni, C. (1998). Personality disorders in drug abusers: Prevalence and their association with AXIS I disorders as predictors of treatment retention. *Addictive Behaviors*, 23(6), 841–853.
- Leber, W. R., Parsons, O. A., & Nichols, N. (1985). Neuropsychological test results are related to ratings of men alcoholics' therapeutic progress: A replicated study. *Journal of Studies on Alcohol*, 46(2), 116–121.
- Leigh, G., Ogborne, A. C., & Cleland, P. (1984). Factors associated with patient dropout from an outpatient alcoholism treatment service. *Journal of Studies on Alcohol*, 45, 359–362.
- Lemke, S., & Moos, R. (2001). Prognosis of older patients in a mixed-age alcoholism treatment programs. *Journal of Substance Abuse Treatment*, 22, 33–43.
- Long, C., Williams, M., Midgeley, M., & Hollin, C. (2001). Within-program factors as predictors of drinking outcome following cognitive-behavioral treatment. *Addictive Behaviors*, 25, 573–578.
- Mammo, A., & Weinbaum, D. F. (1993). Some factors that influence dropping out from outpatient alcoholism treatment facilities. *Journal of Studies on Alcohol*, 54(1), 92–101.
- McLellan, A. T., Luborsky, L., Woody, G. E., O'Brien, C. P., & Druley, K. A. (1983). Predicting response to alcohol and drug abuse treatments. Role of psychiatric severity. *Archives of General Psychiatry*, 40(6), 620–625.
- Mertens, J. R., & Weisner, C. M. (2000). Predictors of substance abuse treatment retention among women and men in an HMO. *Alcoholism, Clinical and Experimental Research*, 24(10), 1525–1533.
- Miller, N. S., Ninonuevo, F., Hoffmann, N. G., & Astrachan, B. M. (1999). Prediction of treatment outcomes: Lifetime depression versus the continuum of care. *American Journal of Addictions*, 8(3), 243–253.
- Miller, W. R., & Rollnick, S. (1991). *Motivational interviewing*. New York: The Guilford Press.
- Miller, W. R., & Tonigan, J. S. (1996). Assessing drinkers' motivations for change: The Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES). *Psychology of Addictive Behaviors*, 10(2), 81–89.
- Milligan, C. O., Nich, C., & Carroll, K. M. (2004). Ethnic differences in substance abuse treatment retention, compliance, and outcome from two clinical trials. *Psychiatric Services*, 55(2), 167–173.
- Moggi, F., Ouimette, P., Moos, R., & Finney, J. (1999). Dual diagnosis patients in substance abuse treatment: Relationship of general coping and substance-specific coping to 1-year outcomes. *Addiction*, (94), 1805–1816.
- Moos, R. H. (1996). *Community oriented programs environment scale manual* (3rd ed.). Redwood City, CA: Mind Garden.
- Moos, R. H. (1997). *Evaluating treatment environments: The quality of psychiatric and substance abuse programs*. New Brunswick: Transaction.

- Moos, R. H., Cronkite, R. C., & Finney, J. W. (1990). *Health and daily living form*. (2nd ed.). Redwood City, CA: Mind Garden.
- Moos, R. H., & Moos, B. S. (2003). Long-term influence of duration and intensity of treatment on previously untreated individuals with alcohol use disorders. *Addiction*, 98(3), 325–338.
- Moos, R. H., Pettit, B., & Gruber, V. (1995). Longer episodes of community residential care reduce substance abuse patients' readmission rates. *Journal of Studies on Alcohol*, 56(4), 433–443.
- Mosher, L., Vallone, R., & Menn, A. (1995). The treatment of acute psychosis without neuroleptics: Six-week psychopathology outcome data from the Soteria Project. *International Journal of Social Psychiatry*, 41, 157–173.
- Moyer, A., & Finney, J. W. (2002). Randomized versus nonrandomized studies of alcohol treatment: Participants, methodological features and posttreatment functioning. *Journal of Studies on Alcohol*, 63(5), 542–550.
- Ouimette, P. C., Finney, J. W., Gima, K., & Moos, R. H. (1999). A comparative evaluation of substance abuse treatment III. Examining mechanisms underlying patient-treatment matching hypotheses for 12-step and cognitive-behavioral treatments for substance abuse. *Alcoholism, Clinical and Experimental Research*, 23(3), 545–551.
- Ouimette, P. C., Finney, J. W., & Moos, R. H. (1997). Twelve-step and cognitive-behavioral treatment for substance abuse: A comparison of treatment effectiveness. *Journal of Consulting and Clinical Psychology*, 65(2), 230–240.
- Rabinowitz, J., & Marjefsky, S. (1998). Predictors of being expelled from and dropping out of alcohol treatment. *Psychiatric Services*, 49(2), 187–189.
- Rees, D. W., Beech, H. R., & Hore, B. D. (1984). Some factors associated with compliance in the treatment of alcoholism. *Alcohol and Alcoholism*, 19(4), 303–307.
- Ryan, R. M., Plant, R. W., & O' Malley, S. (1995). Initial motivations for alcohol treatment: Relations with patient characteristics, treatment involvement, and dropout. *Addictive Behaviors*, 20(3), 279–297.
- Schafer, J. L. (1997). *Analysis of incomplete multivariate data*. New York: Chapman and Hill.
- Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, 7(2), 147–177.
- Shipley, W. C. (1940). A self-administering scale for measuring intellectual impairment and deterioration. *Journal of Psychology*, 9, 371–377.
- Simpson, D. D. (1981). Treatment for drug abuse. Follow-up outcomes and length of time spent. *Archives of General Psychiatry*, 38(8), 875–880.
- Simpson, D. D., & Joe, G. W. (1993). Motivation as a predictor of early dropout from drug abuse treatment. *Psychotherapy*, 30, 357–368.
- Simpson, D. D., Joe, G. W., & Rowan Szal, G. A. (1997). Drug abuse treatment retention and process effects on follow-up outcomes. *Drug and Alcohol Dependence*, 47(3), 227–235.
- Siqueland, L., Crits-Christoph, P., Frank, A., Daley, D., Weiss, R., Chittams, J., et al. (1998). Predictors of dropout from psychosocial treatment of cocaine dependence. *Drug and Alcohol Dependence*, 52(1), 1–13.
- Weisner, C., Matzger, H., & Kaskutas, L. A. (2003). How important is treatment? One-year outcomes of treated and untreated alcohol-dependent individuals. *Addiction*, 98(7), 901–911.